

A NEW SPECIES OF *EUTARSOPOLIPUS* (ACARI: PODAPOLIPIDAE) FROM
AMARA CALIFORNICA DEJEAN (COLEOPTERA: CARABIDAE)
FROM CALIFORNIA

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Abstract.—*Eutarsopolipus capowayensis* Husband and Husband, n. sp. (Acari: Podapolipidae) is described from the Californian carabid beetle, *Amara californica*, and illustrated and compared with related North American *Eutarsopolipus* in the *acanthomus* group.

Key Words: Podapolipidae, mite, *Eutarsopolipus*, new species

Mites in the family Podapolipidae (Acari: Tarsonemini) are all parasites of insects. The genus *Eutarsopolipus* is restricted to Carabidae (Coleoptera) and occurs worldwide. It was erected by Berlese for *E. laganaeformis* Berlese 1913. More than 30 species have been discovered, most of them described by Regenfuss (1968, 1974). This is the first record of *Eutarsopolipus* from the western United States.

The purpose of this paper is to describe *Eutarsopolipus capowayensis*, new species, collected from *Amara californica* Dejean (Coleoptera: Carabidae) in Poway, California, and to compare *E. capowayensis* with related members of the *acanthomus* group described by Regenfuss (1968) (e.g. *E. acanthomus*, *E. alarum*, *E. assimilis*, *E. crassisetus*, and *E. elongatus*), *E. pseudopus* Regenfuss 1974, *E. porteri* Husband 1993, *E. bembidii* Eidelberg and Husband 1993, *E. diunculosus* Eidelberg 1994a, and *E. diachelae* Eidelberg 1994b.

MATERIALS AND METHODS

Numerous specimens of *Eutarsopolipus* were removed from under the elytrae of 5 specimens of *Amara californicus* collected

in Poway, California, and placed in vials in 70% ethanol or mounted on slides. These were compared with specimens in the reference collection of *Eutarsopolipus* spp. at Adrian College, Adrian, Michigan, U.S.A.

Measurements were taken with the aid of a Wild microscope with an ocular micrometer. All measurements are in micrometers. Setae which are no longer than the setal socket are listed as microsetae. Terminology is based on Lindquist (1986).

Eutarsopolipus capowayensis Husband and Husband, NEW SPECIES

(Figs. 1-6)

Female (Figs. 1, 2).—Gnathosoma length 52-60 width 44-51. Palp length 12-15; cheliceral stylets 35-36, dorsal gnathosomal setae 13-17, ventral setae 9-10. Stigmata on stout stalks dorsolateral to base of gnathosoma, atria branch to tracheoles at the level of setae v_2 .

Idiosoma: Length 405-415, width 311-390. Prodorsal plate length 94, width 206, groove between setae v_1 and v_2 ; setae v_1 , v_2 vestigial, sc_2 50-54, setae situated distinctly anterior to posterior margin of prodorsal plate. Distance between setae v_1 57-62; v_2

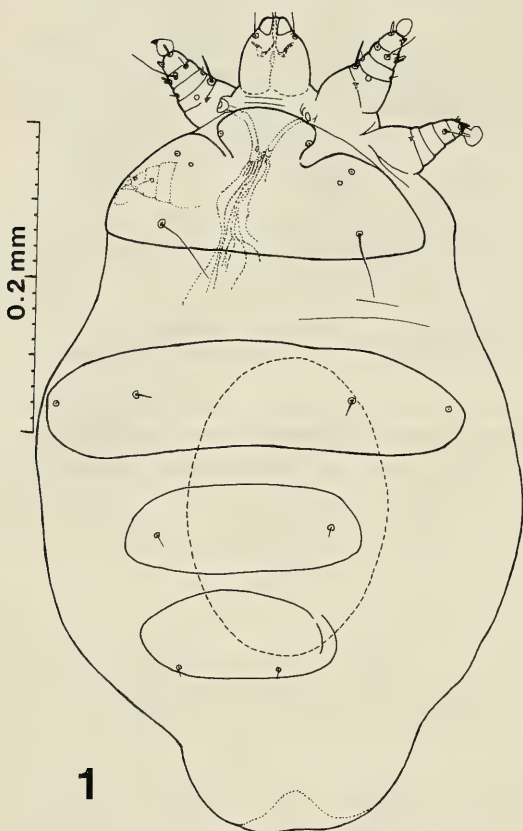


Fig. 1. *Eutarsopolipus capowayensis*, adult female, dorsal aspect.

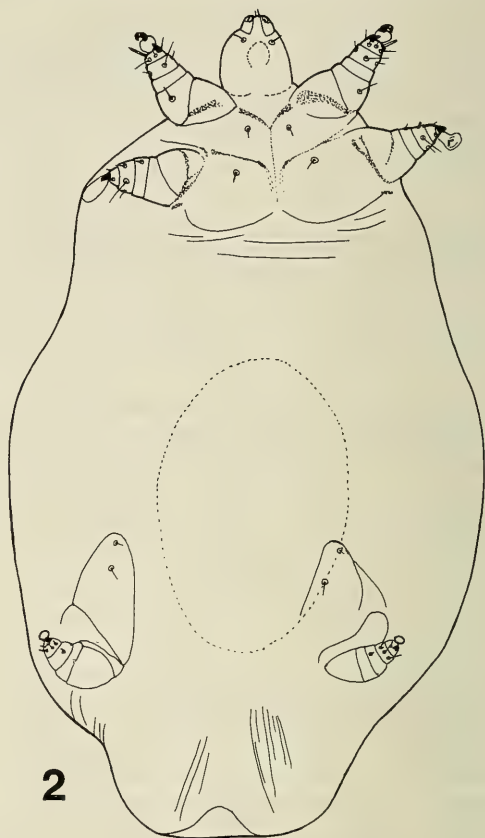


Fig. 2. *Eutarsopolipus capowayensis*, adult female, ventral aspect.

medial to a line connecting v_1 and sc_2 . Plate C length 64–80, width 276–310; width vs. length ratio about 4:1. Setae c_1 13–14, c_2 vestigial. Plate D length 56, width 270, setae d 11. Plate EF length 40, width 160, setae f 6.

Venter with apodemes 1 well developed, meeting sternal apodeme medially; apodemes 2 not extending to sternal apodeme. Coxal setae 1a 8, 2a 8–10; setae 1a situated at the level of junction of apodemes 1, distance from apodeme 1 about equal to length of setae 1. Distance between setae 1a 23, distance between setae 2a 58. Setae 2a nearer sternal apodeme than trochanters 11. Coxal setae 3a 5, 3b 10.

Legs: Leg setation as in Table 1. Ambulacrum 1 with a terminal stout claw, ambulacrum 11, 111 without claws. Single tar-

sus 1 spine, 2 terminal spines on each of tarsi 11, 111. Tarsus 1 and tarsus 11 solenidion omega 2–3, nearly triangular. Tibial solenidion phi 9–10, finger-like. Tibial 1, 11, 111 setae d 28–33, 12–15 and 7 respectively.

Male (Figs. 3, 4).—Gnathosoma length 31–36, width 29–33. Palp length 8–10; cheliceral stylets 20–25; dorsal setae 1–4, ventral setae 3–4.

Idiosoma: Length 150–198, width 120–141. Prodorsal plate wider than long, setae v_1 , v_2 vestigial, setae sc_2 20–33. Distance between setae v_2 greater than the distance between setae v_1 ; setae v_2 lateral to a line connecting setae v_1 and sc_2 . Plates C and D fused, setae c_1 , c_2 , d , f and h_1 microsetae.

Genital capsule length 28, width at base 42, width at apex 16.

Table 1. Leg setation for femur, genu, tibia and tarsus for *Eutarsapolipus capowayensis* and selected species in the acanthomus group. Leg setation for an adult female *E. ochoai* Husband 1995 is included for comparison with a species with the maximum number of tarsal setae for *Eutarsapolipus*.

Species	Leg I				Leg II				Leg III			
	F	G	Ti	Ta	F	G	Ti	Ta	F	G	Ti	Ta
<i>E. capowayensis</i>	3	2	7	9	0	1	4	7	0	1	4	6
<i>E. porteri</i>	3	2	7	8	0	1	4	6	0	1	4	5
<i>E. crassisetus</i>	3	2	7	8	0	1	4	6	0	1	4	5
<i>E. acanthomus</i> ¹	3	2	6	7	0	1	4	6	0	1	4	4
<i>E. pseudopus</i>	3	2	7	9	0	1	4	7	0	1	4	6
<i>E. bembidii</i> ²	3	2	7	8	0	1	4	6	0	1	4	5
<i>E. diacheilae</i> ¹	3	2	5	6	0	1	4	5	0	1	4	6
<i>E. diunculosus</i> ³	3	0	4	7	0	0	4	4	0	0	4	4
<i>E. ochoai</i>	3	2	7	10	0	1	4	8	0	1	4	7

¹ From Eidelberg (1994b). Eidelberg listed 6 setae for tibia II in Table 2 for *E. acanthomus* but illustrated 4 setae on this segment in Figure 4. Four setae is the maximum number of setae for tibia II in Podapolipidae.

² From Eidelberg and Husband (1993). The setae listed here are based on the numbers of setae indicated in figure 3 of this publication, not on the numbers listed in Table 1 of this publication.

³ From Eidelberg (1994a).

Venter: Apodemes 1,2 conspicuous but sternal apodeme weakly sclerotized; coxae 111 separated medially. Setae 1a 2, 2a 2, 3a 1, 3b 2.

Legs: Leg setation as in table 1. Ambulacrum with 1 straight claw, ambulacra 11, 111 without claws. Tarsus 1 spine-like seta *s* 4–5, tarsus 11, 111 spine-like setae *tc'* and *s* 4–6. Tarsus 1 solenidion omega 3, tarsus 11 solenidion omega 2–3, solenidia nearly triangular. Tibia 1 solenidion phi 5–7.

Larva (Figs. 5, 6).—Gnathosoma length 42–47, width 35–41. Palp length 10–16, cheliceral stylets 32–33, dorsal setae 16–19, ventral setae 7–9.

Idiosoma: Length 188–218, width 142–183. Prodorsal plate subtriangular, setae *v*₁, *v*₂ vestigial, *sc*₂ 107–127. Distance between setae *v*₂ greater than the distance between setae *v*₁; setae *v*₂ lateral to a line connecting setae *v*₁ and setae *sc*₂. Setae *c*₁ 10–12, *c*₂ vestigial, setae *d* 8–9. Setae *c*₁ and *c*₂ situated nearly on a straight line on the anterior 1/3 of plate C. Plate EF length 32–47, width 49–55, setae *f* 7–9. Plate H length 28–28, width 34–39, setae *h*₁ 166–190, *h*₂ 17–20, distance between setae *h*₁ 14.

Venter: Apodemes 1,2 and sternal apodeme conspicuous but weakly sclerotized.

Setae 1a 5, 2a 5, 3a 5–7 and 3b 5–7. Setae 1a, 2a and 3b stout. Setae 3a not stout.

Legs: Leg setation as in Table 1. Ambulacrum 1 with 2 slender claws. Ambulacra 11, 111 without claws. Tarsus 1 spine-like seta *s* short and stout 5, Tarsus 11 spine-like setae *tc'*, *u'* and tarsus 111 setae *u'*, 5–7. Tarsus 111 setae *tc'* 6–8. Tarsus 1 and 11 solenidia omega 2–3, tibia 1 solenidion phi 8, adjacent seta *k* 3–5. Tarsus 1 setae *tc'* 9–10, *tc''* 11–12.

Type data.—Holotype female: Poway, San Diego County, California, U.S.A., from under the elytra of *Amara californica* Dejean (Carabidae) collected by D. O. Husband, 27 December 1994. Deposited in the Acarology Collection, Museum of Zoology, University of Michigan, Ann Arbor, MI, U.S.A. (DRH122794-1).

Paratypes: 8 females, 5 males, 5 larval females, 2 eggs, 2 vials with same host and locality data as holotype. One female, 1 male, 1 larval female deposited in the National Museum of Natural History, Washington, D.C., USA.

Etymology.—The species is named for the locality, Poway, California.

Diagnosis.—Female *E. capowayensis* differ from female *E. crassisetus*, *E. porteri*

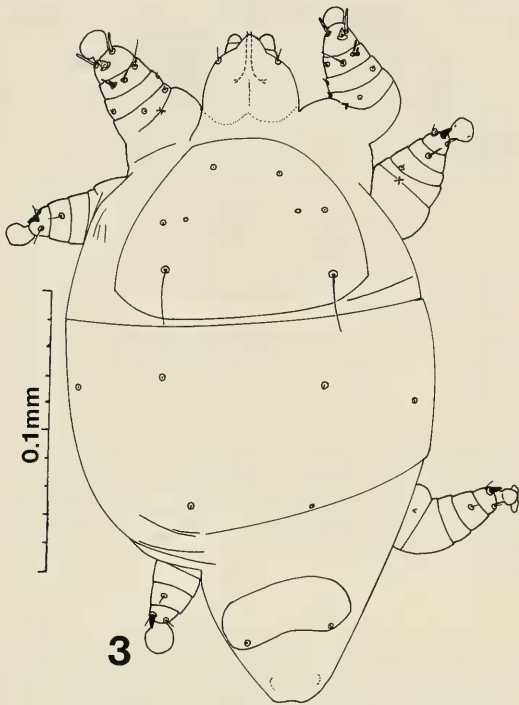


Fig. 3. *Eutarsopolipus capowayensis*, male, dorsal aspect.

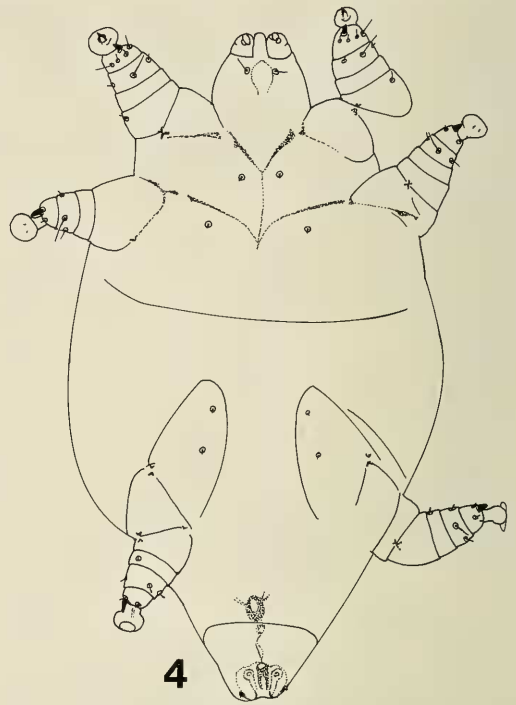


Fig. 4. *Eutarsopolipus capowayensis*, male, ventral aspect.

and *E. elongatus* in having thin coxal setae 1a and 2a. Gnathosomal setae of female *E. capowayensis* are slightly longer than those of *E. crassisetus* but are distinctly shorter than those of *E. porteri*. Grooves in the portion of the prodorsal plate which bears setae v_1 separates this portion from the remaining portion of the prodorsal plate laterally in *E. capowayensis*. Regenfuss (1968) illustrates similar grooves which are less developed in *E. crassisetus*. The remaining species in the *acanthomus* group lack these grooves.

No males are known for *E. alarum*, *E. assimilis*, *E. crassisetus* or *E. elongatus*, and Regenfuss (1968) did not illustrate a male *E. acanthomus*. Gnathosomal setae of male *E. capowayensis* are at most 4 micrometers long in contrast to 11 micrometers for dorsal gnathosomal setae in *E. porteri*. Dorsal gnathosomal setae of larval female *E. capowayensis* are at most 19 micrometers long in contrast to 21 in *E. crassisetus* and 28 in *E. porteri*. Setae c_1 , d

and 3a are thin in larval female *E. capowayensis* but thicker and longer in *E. porteri*. Coxal setae 3a are about equal to coxal setae 3b in *E. capowayensis* in contrast to *E. crassisetus* where coxal setae 3a are about twice the length of 3b. Coxal setae 1a and 2a are microsetae in *E. capowayensis* but are at least two times the diameter of setal sockets in *E. pseudopus*, *E. porteri* and *E. bembidii*. Setae v_1 , v_2 are microsetae in *E. capowayensis* but these setae are longer than the diameter of the setal socket in *E. diunculosus*. Setae c_1 , c_2 are nearly in a line in *E. capowayensis* but setae c_2 are posterolateral to setae c_1 in *E. diachelae*.

Regenfuss (1968) did not describe the larval female stage of *E. assimilis*. Coxal setae 1a and 2a are either on or very near apodemes 1 and 2 in larval female *E. bembidii*, *E. elongatus*, *E. crassisetus* and *E. pseudopus*. These setae are posterior to apodemes 1 and 2 in *E. capowayensis*, *E. acanthomus*, *E. alarum*, *E. diunculosus*, and *E.*

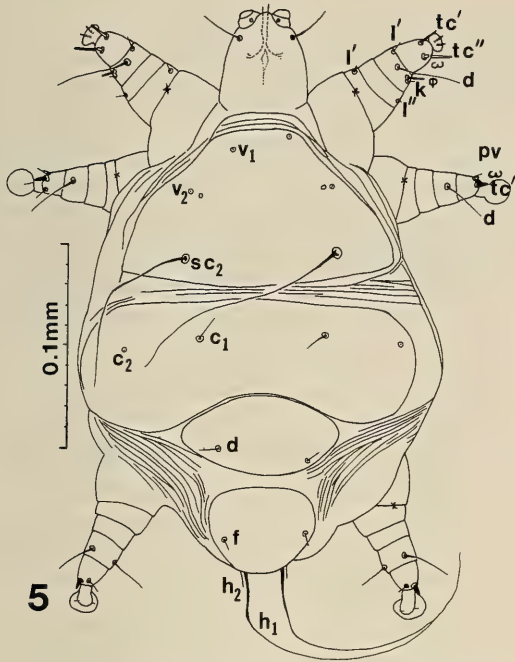


Fig. 5. *Eutarsopolipus capowayensis*, larval female, dorsal aspect.

diacheilae. Of the five latter species, setae c_2 are microsetae in all species except *E. diunculosus*. Eidelberg describes setae 1a and 2a as spine-like for *E. diachelae* in contrast to styletiform in *E. acanthomus*. Setae 1a and 2a are styletiform in *E. capowayensis* and *E. alarum*. These setae are about two times as long as wide and far from the sternal apodeme in *E. capowayensis*, in contrast to setae 1a, 2a being at least 3 times as long as wide and long enough to touch the sternal apodeme, or nearly so.

DISCUSSION

Regenfuss (1968) used the following synapomorphic characters to separate the *acanthomus* group of *Eutarsopolipus* from the remaining groups: females with setae v_1 and v_2 no longer than the setal socket, no apodeme 111, no setae sc_1 and ambulacra 11 and 111 without claws. He also used the following characters: females with long stout femoral L' seta, males with the genital plate about as broad as long, and larval females with setae h_1 widely separated. To

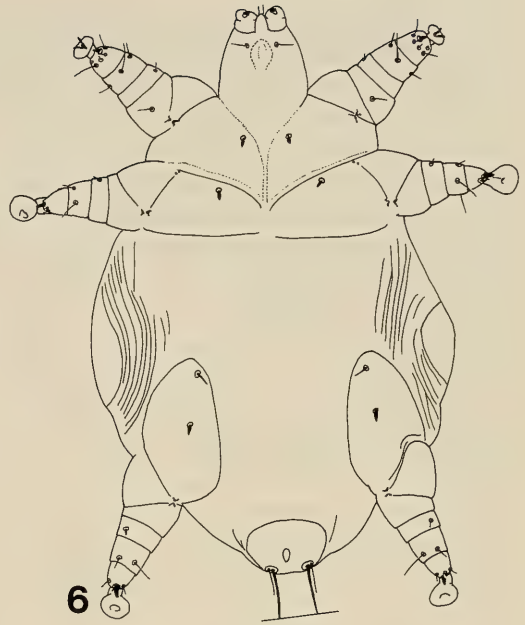


Fig. 6. *Eutarsopolipus capowayensis*, larval female, ventral aspect.

this may be added: males with all dorsal setae except setae sc_2 no longer than setal sockets, coxal setae 3a reduced to microsetae or vestigial; larval females with coxal setae 1a, 2a, 3b thick. The only species of the *acanthomus* complex that are reported from the Western Hemisphere are *E. crassisetus* (introduced to the United States) and *E. porteri*.

The group of *Eutarsopolipus* described as the *acanthomus* group by Regenfuss (1968) included *E. acanthomus*, *E. alarum*, *E. assimilis*, *E. crassisetus* and *E. elongatus*. *E. pseudopus* Regenfuss was added later (Regenfuss 1974). Husband (1993) added *E. porteri* and reported *E. elongatus* from the United States. Eidelberg and Husband (1993) added *E. bembidii* and pointed out that *E. elongatus* in Husband (1993) is *E. crassisetus*. Eidelberg (1994a) described *E. diunculosus* and reported *E. acanthomus*, *E. crassisetus* and *E. elongatus* in Crimea and *E. crassisetus* from Siberia. He also described *E. diachelae* (Eidelberg 1994b). Thus, there are now 11 species in the *acanthomus* group. The three species from the

Western Hemisphere are *E. crassisetus*, *E. porteri* and *E. capowayensis*. This group is worldwide in distribution.

Differences between *E. capowayensis* and other species in the *acanthomus* group are described above. Appropriate host genera of carabid beetles for podapolipid mites exist in the Western Hemisphere and it is likely that many additional species will be discovered on appropriate carabid hosts. More study of tarsal chaetotaxy and aedeagal structures in stages and species not yet known is necessary before appropriate cladograms may be produced.

The host species for *Eutarsopolipus crassisetus* listed as *Amara aenea* in Husband (1993) has been compared to specimens determined by Fritz Hieke by George Ball and is *A. convexa* not *A. aenea*.

ACKNOWLEDGMENTS

We are grateful to George E. Ball of the Department of Biological Sciences, University of Alberta, Alberta, Canada for the identification of the host beetles for *Eutarsopolipus capowayensis* and correction of an error in the identification of the host beetle for *E. crassisetus* collected in Michigan, U.S.A.

LITERATURE CITED

- Berlese, A. 1913. Acari Nuovi. Redia 9: 27-87.
- Eidelberg, Michael. 1994a. Mites of the family Podapolipidae (Heterostigmata, Tarsonemina) of Ukraine and adjacent areas with description of a new species. Vestnik Zoologii 1: 37-43.
- Eidelberg, Michael. 1994b. A new and little-known mite species of the genus *Eutarsopolipus* (Tarsonemina, Podapolipidae) from carabid beetles. Vestnik Zoologii 3: 25-32.
- Eidelberg, Michael and Robert W. Husband. 1993. A new species of *Eutarsopolipus* from *Bembidion saxatile* (Coleoptera: Carabidae). International Journal of Acarology 19(3): 267-272.
- Husband, R. W. 1993. A new *Eutarsopolipus* sp. (Acari: Podapolipidae) from *Harpalus herbivagus* Say (Coleoptera: Carabidae) from Michigan. Great Lakes Entomologist 26(2): 1-13.
- Husband, R. W. 1995. A new species of *Eutarsopolipus* (Acari: Podapolipidae) from Costa Rican *Pasimachus* spp. (Coleoptera: Carabidae). Entomologische Mitteilungen aus dem Zoologischen Museum Hamburg 11(151): 157-165.
- Lindquist, E. E. 1986. The world genera of Tarsonemidae (Acari: Heterostigmata): a morphological, phylogenetic, and systematic revision with reclassification of family group taxa in Heterostigmata. Memoirs of the Entomological Society of Canada 136: 1-517.
- Regenfuss, H. 1968. Untersuchungen zur Morphologie, Systematik und Ökologie der Podapolipidae (Acarina, Tarsonemini). Zeitschrift für wissenschaftliche Zoologie 177(3/4): 183-282. Leipzig.
- Regenfuss, H. 1974. Neue ektoparasitische Arten der familie Podapolipidae (Acari: Tarsonemini) von Carabiden. Hamburgisches Zoologisches Museum und Institut Mitteilungen 71: 147-163.